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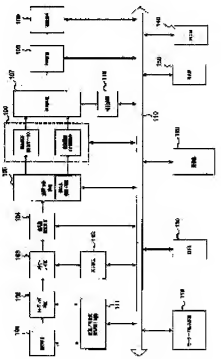
(54) IMAGE PROCESSOR

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an image processor which optimizes read correction with an SDF and that with a press plate, independently of each other and can suitably reproduce an output image of a copy and the binary image of FAX.
SOLUTION: In this image processor, which is provided with a first read mode using the SDF and a second read mode, using the press plate and reads a document in either mode and converts read image information to a digitally converted image signal and processes the digitally converted image signal into an image signal which can be outputted as an apparent image, a press plate/ background plate switching control part 111, which switches the read position by two modes for optimizing read correction in the first read mode and the second mode independently of each other, a shading correction part 102 which performs most suitable shading correction in accordance with two modes, and a stripe correction part 112 which switches black strip correction and white stripe correction according to two modes to perform stripe correction are provided.



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the device which is applied to a digital image device, especially reads a picture from a scanner, and reproduces a picture to a transfer paper.
[0002]
[Description of the Prior Art]In MFT (composite machines, such as a copy and FAX), the multiple-value processing for a copy and the binary processing for FAX are distinguished, and the "image processing device" (JP,8-274986,A) etc. which optimize parallel movement and each image processing are invented. In the system of 400dpi, high definition is mainly maintained.
[0003]
[Problem(s) to be Solved by the Invention]However, communalization of the circuitry of a binary and a multiple value is not made, and also is the picture amendment for a copy, and picture amendment for FAX, and was not having the characteristic of an image taking device taken into consideration in the above-mentioned invention. In reading by a pressure plate, by a copy, reading by a sheet through document feeder (it is hereafter called "SDF" for short.) serves as a subject from the price of systems with FAX with a subject.
[0004]This invention was made in view of this point, and the purpose realizes story tonality and low concentration reproducibility with the device of low cost, and there is in absorbing the difference in the composition of a reader. Especially, the reading amendment by optimization and pressure plate of the reading amendment by SDF is optimized independently, and there is also an outputted image of a copy in the binary format image of FAX providing an image processing device reproducible the optimal.
[0005]

[Means for Solving the Problem]The 1st means is provided with the 1st read mode that uses SDF, and the 2nd read mode that uses a pressure plate in order to attain the above-mentioned purpose, In an image processing device processed so that a manuscript may be read in one of the modes, read picture information may be changed into a picture signal by which digital conversion was carried out and it may become a picture signal in which an output is possible by making into a visual image a picture signal by which digital conversion was carried out, It has an image processing means which optimizes reading amendment independently by said 1st read mode and the 2nd read mode, respectively.
[0006]The 2nd means is [this invention] characterized by that the 1st means comprises the following.
A read position switching means to which said image processing means changes a read position by said 1st read mode and the 2nd read mode.
A control means to which optimal shading compensation is made to carry out according to said two modes.
A stripe compensation means which switches black stripe amendment and white stripe amendment according to said two modes, and performs stripe amendment.

[0007]The 3rd means is [this invention] characterized by that the 2nd means comprises the following.
A means which changes shading correction data according to said 1st read mode and the 2nd read mode.
A means which changes a shading generated interval according to said two modes.
A means to control lamp lighting times according to said two modes.

[0008]The 4th means is [this invention] characterized by that the 2nd means comprises the following.
A means to perform black stripe amendment when reading a manuscript by the 1st read mode.
A means to perform white stripe amendment to a generate time of shading data used when performing a shading compensation.
A means to set up a preset value for white stripe detection arbitrarily according to said 1st mode and the 2nd mode.

[0009]
[Embodiment of the Invention]Hereafter, it explains, referring to drawings for the embodiment of this invention. Drawing 1 is a functional block which shows the composition of the image processing device concerning this embodiment.
[0010]The image processing device concerning this embodiment, A manuscript. The reading

part 101 read optically, the shading correction part 102, the scanner gamma correction part 103, the horizontal-scanning electrical-and-electric-equipment variable power parts 104, the spatial filter treating part 105, the density correction part 106, the gradation processing section 107, the PMW modulation part 108, the writing part 109, matrix RAM119, It has the final controlling element 120, CPU130, ROM140, RAM150, the pressure plate / background plate switching control part 111, the stripe amendment part 112, and the motor-pulses control section 113.

[0011]The reading part 101 reads copy density as catoptric light of a light source here, and changes it into an electrical signal with image sensors, such as CCD. An analog signal is changed into a digital signal. In the shading correction part 102, amendment about the density unevenness of a light source and an optical system is performed to the electric system after digital signal conversion. The white sheet which serves as a concentration standard beforehand is read before manuscript reading here, and this reading signal is stored in the memory. A compensation process is performed between criterion data and read data by a dot unit to each read position of a scanning direction. The digital signal after a shading compensation serves as the linear characteristic about reflectance. This is changed into the linear characteristic about copy density. this conversion measuring the reading characteristic of the scanner beforehand, downloading the translation table used as that inverse characteristic to RAM, and setting in the scanner gamma correction part 103 -- concentration -- it changes into linear data. in the scanner gamma correction part 103 -- concentration -- besides linear conversion, a low concentration part is emphasized, or a level is dropped conversely, and correction effects are heightened.

[0012]The reading part 101 and the shading correction part 102 change a manuscript read position and the amount of data correction according to pressure plate reading and SDF reading, and change them according to the composition of a reading system. About SDF, black stripe amendment to an inputted image is performed about the read data after white stripe amendment concerning shading data in the white stripe amendment about shading data at the time of pressure plate reading. The change of pressure plate reading is performed by the pressure plate / background plate switching control part 111, and amendment of a white stripe or a black stripe is performed in the stripe amendment part 112.

[0013]with gradation processing, although there is no direct relation, the electric variable power processing of a scanning direction can perform by the horizontal-scanning electrical-and-electric-equipment variable power parts 104 -- as -- this image processing device -- it is constituted. In the horizontal-scanning electrical-and-electric-equipment variable power parts 104, expansion and reduction are performed per reading of one line by CCD. In this case, by using the convolution method, variable power processing is performed with MTF in a reading light study system held, and the resolution of image data is maintained. About a width

scanning direction, mechanical control performs variable power processing. Since the convolution method is publicly known art, explanation here is omitted.

[0014]In the spatial filter treating part 105, pretreatment for gradation processing and characteristic quantity are extracted. It has amendment of MTF, data smoothing, detection for an edge line, setting out of a change threshold, etc. as main functions. The output of this treatment module is with the image data by which filtering was carried out, and the change threshold for binary-izing computed from the side condition.

[0015]The data by which the spatial filter process was carried out is inputted into the density correction part 106. In the density correction part 106, to image data and a change threshold, it interlocks and density correction is performed, respectively. This density correction part 106 is a block which changes the reproduction concentration to the gamma correction and the density notch of a write-in system, comprises RAM and can download arbitrary translation data. Although the forms which download image data and the data same to change thresholds are foundations, data which is different in order to change a gradation characteristic intentionally may be used.

[0016]The data by which density correction was carried out changes the density data per pixel into area gradation that it should write in in the gradation processing section 107, and should change into the characteristic of a system. Comprising formation of a simple multiple value, binary-izing, dithering, an error diffusion process, phase control, etc., the conversion to area gradation distributes a quantization threshold in a certain field. Distribution of a threshold downloads any value to matrix RAM119, changes a RAM access means according to mode management, and chooses suitable quantization.

[0017]The data by which gradation processing was carried out performs Pulse Density Modulation for write-in laser in the PWM modulation part 108. The phase control in the gradation processing section 107 is interlocked with PWM modulation, realizes concentration and distribution of a dot smoothly, and performs reproducing gradation.

[0018]The image data by which PWM modulation was carried out by the PMW modulation part 108 reproduces a picture to a transfer paper by imaging to the photo conductor by laser, transfer, and fixing treatment in the writing part 109. Since the composition of this writing part 109 is the publicly known composition as a laser beam printer, explanation here is omitted. Although a laser beam printer is written in here and it is shown as a system, in development systems, such as an ink jet, the phase control for dot reappearance can develop as common approach only by below PWM modulation block composition differing.

[0019]Setting out of the gradation processing in the gradation processing section 107, the change of density correction, etc. are interlocked with the operation mode from the final controlling element 120. Mode management is chosen with a pattern subject's manuscript, a character subject's manuscript, etc., and the parameter of density correction also changes

setting out according to a thin manuscript and a deep manuscript. Actual system control sets up the preset value to RAM, and the course of a processing path to each functional block to setting out from the operation mode via CPU130 in system bath 110 course. The carriage movement controls for reading detect the count number of a motor pulse, and adjust the movement magnitude of a scanner running body by the motor-pulses control section 113.

[0020]As for ROM140, static data including the control program of CPU30 is stored, and while RAM150 functions as a data area of CPU130, the data used for processing of CPU130 is stored.

[0021]The outline of the scanner gamma correction part 103 and the density correction part 106 is shown in drawing 2. The figure (a) shows scanner gamma correction, and the figure (b) shows the translation table of density correction. The density characteristics of (1) of drawing 2 (a) show the transfer characteristic with the image data after the shading compensation to copy density, and it does not have the linear characteristic. In the low concentration part, it is rapidly saturated with the standup high concentration part on an electrical signal. Generally it becomes the characteristic of Exp (gamma). this -- concentration -- multiplying by the transfer characteristic of Exp (1/gamma) shown in the figure (2) in order to make it change to a linear signal -- concentration -- a signal is changed into linear space. Thereby, the dynamic range of a concentration signal increases.

[0022]The output density correction of drawing 2 (b) amends the gamma characteristics to the pro cell reaction of a write-in system, downloads the translation table for carrying out a density change further to RAM, and multiplies by weighted solidity. Specifically, it replaces with reference to data as a look-up table. By drawing 2 (b), a convex makes a low concentration part reproduce on a curve, and a convex shows below the characteristic of flying the low concentration part equivalent to natural complexion. Data can set up any value on balance with the mode and a density notch.

[0023]In order to give the flexibility of density reproducibility and a tone reproduction, a conversion parameter gives optionality by the download to RAM. The target RAM is a thing about setting out of the quantization threshold for the density correction about scanner gamma correction and image data, the density correction to an abnormal-conditions threshold, a dither, and an error diffusion process, and the switching means of the data download from CPU130 and a look-up table is common.

[0024]The functional constitution of a change of access and table reference from CPU130 of RAM301 is shown in drawing 3. RAM size can be set up arbitrarily and the address space should have only a gradation number per pixel of an inputted image. For example, an address space will be set to 8 bits if it is a system which carries out the A/D conversion of the CCD data at 8 bits.

[0025]To the address of RAM301, the address bus from CPU130 is connected via the

multiplexer 302 at the time of the CPU access mode for data download, and the data input terminal of RAM301 writes in the data from CPU130. RAM301 downloads referred data in write mode. Although the example of clock (CLK) synchronous synchronous method RAM is shown in this embodiment, also in asynchronous RAM, the switching system in CPU mode and data reference mode is the same.

[0026]In the usual image processing mode, an inputted image to be changed is connected to the address terminal of RAM1301, and RAM301 is set as read mode. The translation table value stored in the address corresponding to input data by this is computed as an output of RAM301. circuitry and arithmetic processing time are mitigable by composition of RAM301 -- optionality reservation of data -- it can do. Directions of READ/WRITE are inputted into an enable terminal via the multiplexer 303.

[0027]The functional constitution of the density correction part 106 and the gradation processing section 107 is shown in drawing 5. Those with three piece, RAM(1) 551, RAM(2) 552, and RAM(3) 53 show reference RAM as a look-up table. RAM (1) The gamma correction table [as opposed to a change threshold in 551] for converted density, the gamma correction table [as opposed to image data in RAM(2) 552] for converted density, and RAM(3) 553 are a dither and error diffusion threshold matrix RAM.

[0028]Constitute the path for binary processing, and the path for multiple-value processing, and each processing is performed about simple binarization processing by each image processing portion of the change binarization processing part 501, the tip pixel control processing part 502, and the binary filter treating part 503, After choosing a binary by the binary selecting part 511, a binary signal is further outputted from the selecting part 513. A binary and a multiple value carry out a dither and an error diffusion process by the common circuit 504, i.e., a binary / multi value dither processing part, and the binary / multiple-value error diffusion processing part 505. RAM (3) The selecting part 510 changes the data content of 553, and address access control, and processing of the binary/multiple value of said dither treating part 504 and the error diffusion processing part 505 is changed.

[0029]About each processing of the multi-valued-levels conversion process part 506 and the multiple-value error diffusion processing part 505, the phase control parts 507 and 508 are added for the topology for dot formation according to the concentration distribution before and behind a scanning direction together with concentration processing. For example, in ternary-izing, a signal level assigns 2 bits and can set up the state of "00", "01", "10", and "11." Usually, although there is this by 4 value-ization, if "00" is set as white, "11" is set as black and "01" and "10" make pulse width in PWM duty 50%, as a concentration level, it will become ternary. "01" makes laser turn on in the right half in a dot formation field by a right phase also by duty the same 50%. "10" makes laser turn on in the left half in a dot formation field by a left phase. Linkage with the PWM modulation block 108 defines a phase and concentration as

mentioned above, and it decides on processing.

[0030]Also in ternary-izing of a multiple-value dither, the appearance carries out pulse code generating. This is shown in drawing 7. About multiple-value processing, simple edge detection of a scanning direction is performed in the simple edge detection section 514, and a simple multiple value and a multiple-value error diffusion process are selected by the selecting part 509 by line segment edge information.

[0031]When RAM(3) 553 are constituted from 8 bits of address spaces in drawing 6, the situation in the case of using it by download of a binary dither matrix is shown. As binary dither-matrix size, the scanning directions 4 and 6, 8 or 16 pixels, the vertical scanning directions 4 and 6, and 8 or 16 pixels can be set up in arbitrary combination. According to states, such as line infanticide of the number of required lines, and a picture, combination and pattern information are chosen by the binary selecting part 511. RAM (3) Access of 553 is the purpose of facilitating operation and is sought not based on sequential access but based on two-dimensional array. Composition on control is easy.

[0032]drawing 7 is a figure showing the contents which access RAM(3) 553 for multiple-value dither matrices -- the object for multiple-value dithers -- the matrix size 4x4 (drawing 7 (a)), 6x6 (drawing 7 (b)), and 8x -- the state of ternary-izing is shown per 8 (drawing 7 (c)) or pixel. Although access of matrix size is made into two-dimensional array, the adress numbers of a scanning direction need a twice as many number as this. In the matrix of 4x4 of drawing 7 (a), a scanning direction assigns each pixel two address, and carries out 8 address reference. Refer to the threshold of A0 and A1 for the pixel of A internally. Thereby, each matrix corresponding picture elements perform the threshold of two pieces, and comparison operations. In the case of the left pulse, the threshold which consists of size relation of A0<A1 is set up, and, in the case of the right pulse, a threshold is set as the reverse due to A0>A1. if the pixel of the position of A is smaller than A0 and A1, "00" will be assigned as a quantization result -- A0 and A1 -- when larger than any, the code of "11" is assigned as laser lighting times over a pulse field entire interval. When a pixel to be quantized is between A0 and A1, the codes assigned by the right pulse (right phase) and the left pulse (left phase) differ. Let the case "10" where the left pulse sequence is assigned for the case "01" where the right pulse sequence is assigned be a quantized code, respectively. Also in the remaining matrix pixels of drawing 7 (a) and drawing 7 (b), and (c), pulse code is generated by the same definition. It realizes by considering phase generation fundamentally and downloading a threshold array to RAM.

[0033]The processing constitution of a binary and a multiple-value error diffusion process is shown in drawing 8. This processing constitution comprises functionally the add operation part 801, the quantization selecting part 802, the error operation part 803, the error operation part 804, the error weighting sum-of-products part 805, and RAM(3) 553 (change threshold storage

806), The quantization threshold to the sum-of-products result of an inputted image and a circumference error is chosen from a fixed value and a change threshold. The change of a fixed value and a change threshold is shown in drawing 4.

[0034]When using a change threshold, the threshold repeated by a certain block unit is set as RAM(3) 553. Drawing 8 (b) shows an example of the threshold setting of the variable region of the matrix of 8x8 in the case of a binary. A texture is reduced by fluctuating a threshold within a block. Preservation of edge and the balance of a tone reproduction can be adjusted by making the fixed value and variation of a threshold intermingled in the matrix domain of 8x8.

[0035]To 1 pixel of a correspondence matrix, in the case of a multiple value, two or more thresholds are given, and it changes a quantized code. About a phase, it rearranges in the state of the change concentration distribution of a scanning direction separately. Although the coefficient of two lines x 5 pixels using one-line FIFO is shown about error product sum operation, this is only a mere example and MATORIKU size and coefficient distribution can be changed.

[0036]The change composition of the change threshold of the threshold for quantization and a fixed threshold is shown in drawing 4. A threshold is changed by system bath 110 course, and either a change threshold or a fixed threshold is chosen by the selecting part 401 by setting out in the mode. In the case of error diffusion, about a change threshold, the threshold which refers to the preset value of RAM(3) 553 on horizontal scanning, the address control of a vertical scanning direction, and the level of multiple-value-izing is controlled. In the formation of a simple binary, it is set up in the spatial filter part 105, and it uses the threshold by which density correction was carried out. The fixed threshold can use not the value fixed in hard but the value set in the register by the CPU140 course as a fixed value, and the fixed value itself can change it with the mode and a picture characteristic. As compared with inputted image data, the comparison result is outputted by the comparing element 402 using the threshold selected in this way.

[0037]The outline of the spatial filter treating part 105 is shown in drawing 9. In the spatial filter treating part 105, using two or more line memories 901, the two-dimensional picture matrix 902 is formed and amendment of the frequency characteristic of a picture and characteristic quantity extraction from density characteristics are performed in this two-dimensional space.

[0038]Since the MTF correction part 903 amends the MTF deterioration in an optical system, it has composition which can carry out free setting out of an MTF correction coefficient and the corrected intensity, and can be widely adapted for the kind of mode management, a reading manuscript, and optical system at horizontal scanning and vertical-scanning independence. The isolated point primary detecting element 904 detects the natural complexion noise and manuscript noise generation degradation is expected to be. The regularity of pixel arrangement is detected, it distinguishes whether it is a perfect isolated point or they are some

low-concentration halftone dot manuscripts, and the target pixel is narrowed down. In the isolated point removing part 904, it supposes [whether it is replaced by the average value of a peripheral pixel whether the detected isolated point is removed thoroughly, and] that it is selectable, and a noise component deletes. You carry out thinning / thick line-ized treating part 906 to scanning direction vertical scanning direction independence, it makes it the correction factor of MTF interlocked with, and adjusts the balance of the main ** of line density reproducibility.

[0039]The data-smoothing part 907 extracts a halftone dot manuscript, removal of the moire component generated by clinch distortion at the time of an A/D conversion, and the circumference information for change threshold setting. The edge detection section 908 detects a part for the edge line of level, perpendicularity, and right-and-left oblique components, and generates the control signal for the switch signal for filtering adaptation, and change threshold selection. The video path with which the data of a non-edge component was smoothed in the video path with which MTF correction of the edge component was carried out by the selector 909 is selected, and a filter correction picture is chosen.

[0040]The change threshold setting for the formation of a simple binary sets a threshold by the change threshold setting portion 910 for every pixel with a smooth picture signal, an edge signal, etc.

[0041]The outline of the threshold set in the threshold setting portion 910 is shown in drawing 10. The threshold setting portion 910 is provided with the level determination part 1001 and the selector 1002, is the level determination part 1001 and compares with the upper limit and lower limit by which register setting is carried out to the picture signal whose data was smoothed. Each limit value prescribes a smooth signal for use by the noise and a concentration stable zone. In below a lower limit, it is a lower limit, and in more than upper limit, it is upper limit, and it replaces each smoothing signal. A smoothing signal is used for the signal which exists in Seki of both limit values as it is.

[0042]In the selector 1002, it is chosen whether the signal of a data-smoothing system is used, using the fixed value set up by the register with an edge signal. As for a non-edge part, in the case of the perfect change threshold made to follow ground concentration, an edge part sets a data-smoothing system signal as a fixed threshold as a change threshold. When making high-concentration edge and low-concentration edge separate and reproduce, two steps of thresholds are set up. In this case, an edge part is set as a fixed value and a non-edge part is set as the signal of a data-smoothing system. Fundamentally, a stationary type value functions as the binarization threshold for high concentration edge, and a binarization threshold for the edge of low concentration [lower limit set value / over smooth data].

[0043]The outline of isolated point detection is shown in drawing 11. Isolated point detection is performed by each functional block of the matrix selecting part 1101, the comparing element

1102, the state transition portion 1103, and the judgment part 1104. In the matrix selecting part 1101, in order to detect the state of the isolation from the circumference, when the noticed picture element (center of matrix) pixel and the pixel of the outermost periphery are thoroughly divided in the picture matrix of 5x5, 7x7, or 9x9, it is regarded as an isolated point. The isolated point to the size of a maximum of 4x4 is detectable using the matrix size of 7x7 at the time of actual size. In reduction, since an interval with an isolated point pixel and a peripheral pixel is also reduced, in order to detect the isolated point pixel of 4x4 by reduction 50%, the lump of the pixel size 2x2 should just be detected with the matrix size of 5x5. Conversely, in not less than 200% of expansion, the isolated point pixel of 4x4 on a manuscript will also be expanded, if it does not extend to the matrix size of 9x9, it becomes impossible to detect, and an isolated point will remain at the time of expansion. By making it a variable power rate interlocked with, and changing the value of kmx, the matrix size for isolated point detection is changed.

[0044]The low-concentration dither pattern which is the useful information in a manuscript will also be deleted only by the isolated point detection by the conditions of the surrounding picture elements within the matrix size of 5x5 or 9x9. In order to cancel this fault, in the comparing element 1102, the restrictions by a change state are added in the restrictions by comparison with the threshold of kbth, and the state transition portion 1103, and only a true isolated point is detected. The value of T1 shows whether pixel having is a white ground or an isolated point. It is set to T1=0 when that is not right, case T1=1 of a white ground or an isolated point, and. By a threshold decision, T2 shows whether pixel having is a white picture element. When smaller than a threshold, T2=1 shows a white ground, and in beyond a threshold, T2=0 shows a non-white ground. A white ground and an isolated point are distinguished by these T2.

[0045]the number of white picture elements which follows the judgment of a change state from T1, T2, and these, and the size of an isolated point -- respectively -- a total of several white picture elements -- copy 1105 and isolated point size -- calculation -- it counts in the part 1106 and is considered as the conditions for a change state. Although the value of state shows the state of a pixel, Pixel having changes intuitively between PAPER which is the field where the white picture element is continuing widely, DOT whose pixel having is an isolated point, or PICT whose pixel having is the fields where the pattern, the character, the low concentration halftone dot part, or the white picture element is not continuing widely. A state begins from PAPER.

[0046]The compensation process of the isolated point detected by drawing 12 is shown. The detection result of an isolated point is shown by result and performs a compensation process to image data mtfo after MTF correction. emphasis processing of this mtfo is carried out, and the isolated point is reinforced -- processing of this as -- two or more times -- repeating (grandchildren copies are taken) -- a generation will get worse and will be a low quality output in which black Poti Poti is conspicuous.

[0047]About an isolated point, MTF emphasis is not carried out, smooths data with the circumference, or is transposed to a white level. At the selecting part 1201, ON/OFF of processing of isolated point removal is changed by kmod, it outputs, and the correction level in the case of processing by the intensity operation part 1202 is changed by ktj. In this case, removal intensity is made into the maximum for conversion to a compulsory white level, and 1/32 of mtfo, 1/8, 1/2, and a correction level are weakened.

[0048]The details of a compensation means system of the scanner read image of the shading correction part 102, the scanner gamma correction part 103, and stripe amendment part 112 grade are shown in drawing 13. A shading compensation is performed by two processings of normalization by the shading data of the inputted image in generation and the shading correction part 1305 of the shading data in the shading data generating part 1301. Although shading data is generated from the reading signal of the reference whiteboard 1606-1611 (drawing 16) by the white-reference-data generation part 1301 for shading, the reference whiteboard 1606-1611 read by a pressure plate is changed to SDF. This change is performed by a pressure plate / background plate switching control part 111 as mentioned above. In the case of a pressure plate, a carriage starts from a home position, before reading the manuscript ****(ed) by contact glass 1605 (drawing 16) field, the white sheet 1606 set as the contact glass upper bed part is read, and the criterion data for shading compensations is computed.

[0049]In SDF, it is selectable in two kinds of modes in which the reference whiteboard 1606 of the 1605th page of contact glass and the background plate 1609 of a document feeder are read. In the case of the background plate 1609, a carriage is moved to a read position, and before a manuscript is conveyed, the state of the white sheet 1611 currently stuck on the background plate 1609 is read through a transmitting glass side. In this case, movement of a carriage turns into one movement from a home position. The white sheet reading on the contact glass at the time of SDF use needs to move a carriage from a home position to the white sheet lower, and needs to turn back a carriage from there to a document feeder read position. Therefore, a carriage must be made to move reciprocately frequently when two or more reading manuscripts continue. In the case of the background plate 1609, reciprocating movement of a carriage is unnecessary. Fundamentally, in SDF, the background plate 1609 of DF is used as the reference whiteboard 1611.

[0050]Generation of shading data performs two or more lines reading pile averaging for the reference whiteboard 1606-1611. In the case of the background plate 1609, identical places will be read two or more times, but the levels of line read data differ the whole twist in the disturbance of a lamp, dispersion of dust, etc.

[0051]When a white level changes too much with influences of garbage etc. about the white reference data stored in the line memory 1302, since a display in white of a picture will also be simultaneously performed if a shading compensation is performed as it is, a white stripe

picture will occur. The inaccurate pixel on a reference whiteboard detects a white stripe factor in the white stripe primary detecting element 1303, amends reference whiteboard data in the white stripe amendment part 1304 from the surrounding normal pixel, and stores it in the line memory 1302 again.

[0052]Manuscript reading by a pressure plate and the shading data generation by the background plate 1609 of SDF remake criterion data for every manuscript reading each time. When using the white sheet 1606 on SDF and the 1605th page of contact glass, movement of a carriage stops high-speed machinery being of use for. If it is a high speed, as what does not not much have lamp change, processing which thins out shading generation by 1 time of frequency in several manuscripts will also be carried out as a combination.

[0053]In SDF, a carriage is fixed under the background plate 1609 and a picture is read by making a manuscript convey. In the case of a pressure plate, a manuscript is ****(ed) to the 1605th page of contact glass, and a picture is read by moving a carriage. When the 1605th page of contact glass has garbage, as an output of picture reproducer, it is reproduced as a punctiform picture of an input and identical shape.

[0054]On the other hand, even if the fixed station has punctiform garbage in SDF, a reproduced image is reproduced in the shape of a stripe. Therefore, since existence of an abnormal image becomes remarkable, in SDF, black stripe amendment is carried out. Then, after shading data generation, before reading a manuscript picture, the reading surface under the background plate 1609 is read independently, Check the existence of garbage in the black stripe primary detecting element 1306, and the place where garbage was detected is stored in the line memory 1307 different from shading data, When reading a manuscript picture, the picture of the position in which garbage exists in the black stripe amendment part 1308 is amended from a surrounding normal pixel, and the black stripe by garbage is made to reduce. However, since a possibility of erroneous detection and not amending remains, when the garbage picture of a certain quantity is detected, it urges also to the warning which removes garbage.

[0055]The compensation table referred to when the shading correction part 1305 performs a shading compensation to ROM1311 is stored, and the compensation table referred to when a scanner gamma correction part amends gamma characteristics to RAM1312 is stored. The numerals 1313 are the peak detection and AE mode parts which detect the peak value of the data from the white-reference-data generation part 1301 for shading, and set up auto exposure mode. The numerals 1314 are automatic regulation parts which adjust a lamp output automatically based on the data from the white-reference-data generation part for shading.

[0056]The detection means of an abnormal pixel is shown in drawing 14. Detection of an abnormal image is the same also as a black stripe / white stripe. Since only direction of signal logic is reverse, the abnormal pixel detection for white stripe amendment is shown. If the

reference whiteboard of concentration distribution uniform originally is read, the signal level which shows white will be detected. When garbage adheres there, compared with a peripheral pixel, a signal level deviates to the black side. A level difference is distinguished with a threshold and an abnormal pixel is classified.

[0057]To the noticed picture element S (n), eight kinds of parameters are set up and each threshold is compared with an applicable calculation signal. The disregard level from which a threshold detects the standup state as a white stripe (wulvth), It is with the threshold (wu1th, wu2th, wu3th) which detects the degree of a standup with an adjacent pixel, the disregard level (wd1vth) which detects a standup state, and the threshold (wd1th wd2th, wd3th) which detects the degree of a standup with an adjacent pixel.

[0058]The conditions of the abnormal pixel as a white stripe should be just equivalent to either the conditions of a standup, or the conditions of a standup.

[0059]. [whether standup conditions have S (n+1) larger than wulvth, and S(n+1)-S (n) is larger than wu1th and] Or S(n+1)-S (n) is larger than wu2th, and in S (n), S(n+2)-S (n) becomes an abnormal pixel on the way of a standup, when larger than wd3th.

[0060]S (n) is larger than wd1vth, and falling conditions are S(n-1)-S (whether (n) is larger than wd1th.). Or S(n-1)-S (n) is larger than wd2th, and S(n-2)-S (n) is S ((n) becomes an abnormal pixel on the way of falling.), when larger than wd3th.

[0061]A pixel clearly lower than the signal level of an original reference whiteboard is detected.

[0062]The compensation means about a detection pixel is shown in drawing 15. The case where should consist the row of the pixel of 5 pixels of D (n-2), D (n-1), D (n), D (n+1), and D (n+2), and D (n) is detected as an abnormal pixel is shown.

[0063]A dotted line shows the level transition between the pixels of an input signal. About D (n), since it was a 1-pixel abnormal pixel, it amends in a peripheral pixel. Correction value is computed using the signal level of D (n-2) and D (n+2) by D(n-2)+ (D(n+2)-D (N-2)) (x2) / 4.

[0064]An abnormal pixel may not be restricted in 1 pixel, but may continue. [two or more] In that case, the width of an abnormal pixel (defect) pixel is amended and picture amendment is performed. In the case of the defect pixel of the 1-pixel above-mentioned defect pixel (width+3 of a defect pixel), it normalizes.

[0065]The following correction formulas are applied as a general formula.

[0066]Shading data after amendment = < left reference pixel >+(<right reference pixel>-< left reference pixel >) (x <pixel number from left reference pixel>) / (width >+3or5or7 of < defect pixel)

Extension of the defect pixel width of a denominator is set to 7, when a defect pixel is 1, three defect pixel is 2 and five defect pixel is 3.

[0067]The structure of a reading part is shown in drawing 16. A scanner makes it run the lamp

1601, inputs a picture for every line, and carries out image formation to CCD. A manuscript is irradiated with the light of the lamp 1601, the mirror 1602-1603 receives catoptric light, and even a photo detector connects the optical path 1604. Generally there is contact glass, a manuscript is carried on it, and it is made to run a lamp. In a contacting glass surface, the portion of 1605 of a figure becomes a place which places a manuscript. The reference whiteboard 1606 exists in the left end (home position side of a scanner running body) of the contact glass 1605, and it is stuck on the rear face of the contact glass 1605. The bottom of the field 1607 black [the] and smeared away becomes a home position of a scanner.

[0068]In the case of sheet through and DF, a manuscript is moved and a picture is read. The lamp (carriage) 1601 moves to a left-hand side manuscript read position from a home position, and only the lamp 1601 turns it on, stopped on that occasion until it read the manuscript. A manuscript is conveyed from the portion of 1608 of a figure, passes through the bottom of the background plate 1609, and paper is delivered to it from 1610 along with the shape of a curved surface. A conveyance manuscript is pressed down with the background plate 1609 in a glass surface.

[0069]The reading procedure of a manuscript is shown. When it fixes a manuscript using a pressure plate, the carriage carrying said lamp 1601 and the mirror 1602-1603 which are standing by at the home position moves rightward with a manuscript read start. Movement speed is slow at the time of expansion, and it becomes quick at the time of reduction. When passing through the bottom of the reference whiteboard 1606, a white sheet picture is read over two or more lines, and shading data is generated. Then, after reading the manuscript on the contact glass 1605, the nonuniformity of a reading system is amended based on the shading data stored.

[0070]Since image reading is completed by the linear movement from the home position of a carriage to the right, shading generation and a shading compensation can be performed for every job.

[0071]In SDF, it moves leftward from a home position in a carriage, and a running body stops and the lamp 1601 carries out to having made the light switch on freely. The reference whiteboard 1611 attached to the background plate 1609 is read time to be equivalent to two or more lines, and shading data is generated. Before conveying a manuscript, a contacting glass surface is read again, and a garbage picture is detected. A dark pixel is made applicable to detection to the background plate 1609. The position information on a defect pixel is stored in the line memory 1307, a manuscript is conveyed from sheet carrying-in side 1608, and a picture is read. A shading compensation and black stripe amendment are carried out to a read image (1305-1308). After performing a shading compensation and black stripe amendment, scanner gamma correction 1309 is performed and data smoothing 1310 is performed further.

[0072]The carriage does not need to return to a home position until the manuscript number of

sheets set to sheet carrying-in side 1608 is completed, and it carries out shading generation, a shading compensation, and black stripe amendment for every one manuscript.

[0073]

[Effect of the Invention]By old explanation, according to this invention, the following effects are done so so that clearly.

[0074]Since it has the image processing means which optimizes reading amendment independently, respectively by the 1st read mode that uses a sheet through document feeder, and the 2nd read mode that uses a pressure plate according to the invention according to claim 1, The device of low cost can realize story tonality and low concentration reproducibility, and the difference in the composition of a reader can be absorbed. The outputted image of a copy can also provide the image processing device which the binary format image of FAX can also optimal reproduce.

[0075]The read position switching means to which an image processing means changes a read position by the 1st read mode and 2nd read mode according to the invention according to claim 2, Since it has the control means to which the optimal shading compensation is made to carry out according to said two modes, and the stripe compensation means which switches black stripe amendment and white stripe amendment according to said two modes, and performs stripe amendment, the common characteristic of a read image can be guaranteed.

[0076]The means which changes shading correction data according to said two modes according to the invention according to claim 3, Since it has the means which changes a shading generated interval according to said two modes, and a means to control lamp lighting times according to said two modes, the generation method of shading data can be changed according to the two modes.

[0077]A means according to the invention according to claim 4 to perform black stripe amendment when reading a manuscript by the 1st read mode, Since it has a means to perform white stripe amendment at the time of shading data generation, and a means to set up the preset value for white stripe detection arbitrarily according to said two modes, generating of the abnormal image of black or the shape of a white stripe depending on a difference of the mode can be made to reduce.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram showing the entire configuration figure of the image processing device concerning one embodiment of this invention.
[Drawing 2]With the figure showing the density conversion characteristic of the image forming device concerning this embodiment, (a) shows the translation table of scanner gamma correction, and (b) shows the translation table of density correction.
[Drawing 3]It is a block diagram showing the functional constitution of a change of access and table reference from CPU to RAM which downloaded the translation table for carrying out the density change in this embodiment.
[Drawing 4]It is a block diagram showing composition in the change of the fixed value in binarization processing, and a change threshold in this embodiment.
[Drawing 5]It is a block diagram showing the functional constitution of the density correction part in this embodiment, and a gradation processing section.
[Drawing 6]It is a figure showing the composition of the dither matrix for binaries in this embodiment.
[Drawing 7]It is a figure showing the composition of the dither matrix for multiple values in this embodiment.
[Drawing 8]It is a figure showing the processing constitution of the binary in this embodiment, and a multiple-value error diffusion process.
[Drawing 9]It is a figure showing the outline of the spatial filter treating part in this embodiment.

[Drawing 10]It is a figure showing the outline of the threshold set in the threshold setting portion in this embodiment.
[Drawing 11]It is a figure showing the outline of the isolated point detection in this embodiment.

[Drawing 12]It is a figure showing the functional constitution of the compensation process of the isolated point in this embodiment.
[Drawing 13]It is a figure showing the functional constitution of picture amendment of the scanner in this embodiment.
[Drawing 14]It is a figure showing the detecting method of the black / white abnormal pixel in the image processing device in this embodiment.
[Drawing 15]It is a figure showing the correcting method of the black / white abnormal pixel in the image processing device in this embodiment.
[Drawing 16]It is a figure showing the composition of SDF/pressure plate in the image processing device in this embodiment.
[Description of Notations]
101 Reading part
102-1305 shading correction parts
103-1309 Scanner gamma correction part
104 Horizontal-scanning electrical-and-electric-equipment variable power parts
105 Spatial filter treating part
106 Density correction part
107 Gradation processing section
108 PWM modulation part
109 Writing part
110 Matrix RAM
111 A pressure plate / background plate switching control part
112 Stripe amendment part
113 Motor-pulses control section
1301 The white-reference-data generation part for shading
1303 White stripe primary detecting element
1304 White stripe amendment part
1306 Black stripe primary detecting element
1307 Black stripe amendment part

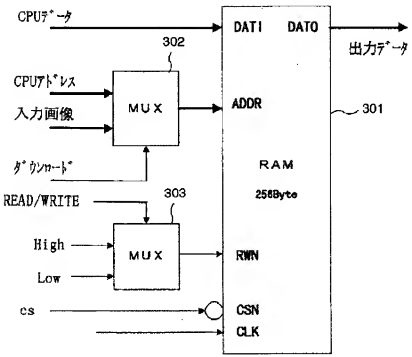
[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

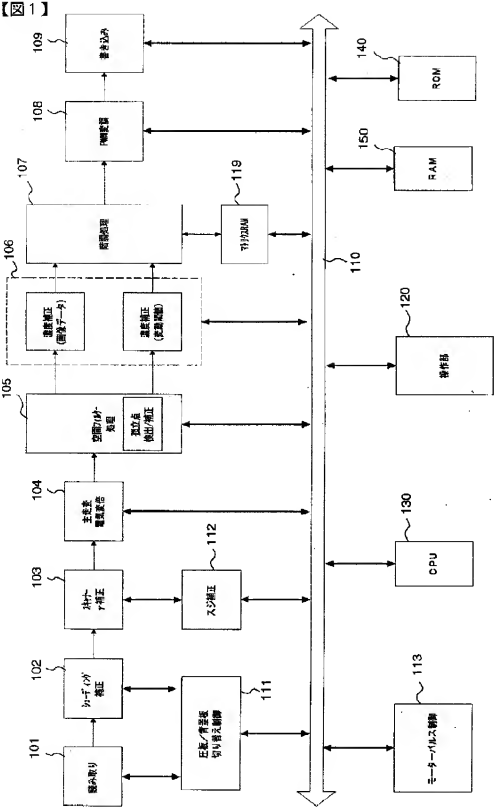
DRAWINGS

[Drawing 3]
【図３】



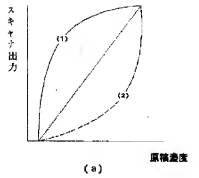
[Drawing 1]

【図１】


109
書き込み
108
107
119
106
105
104
103
102
101
140
ROM
150
RAM
110
120
操作部
130
CPU
112
113
111

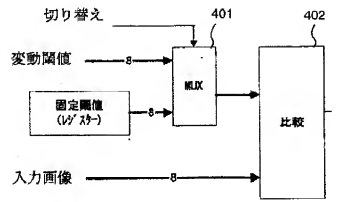
[Drawing 2]

【図２】



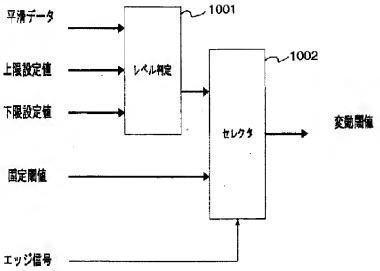
[Drawing 4]

【図４】



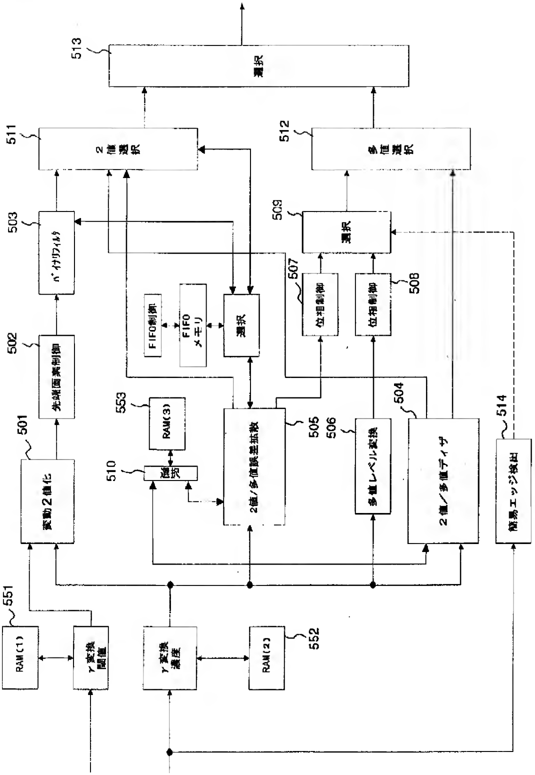
[Drawing 10]

【図１０】



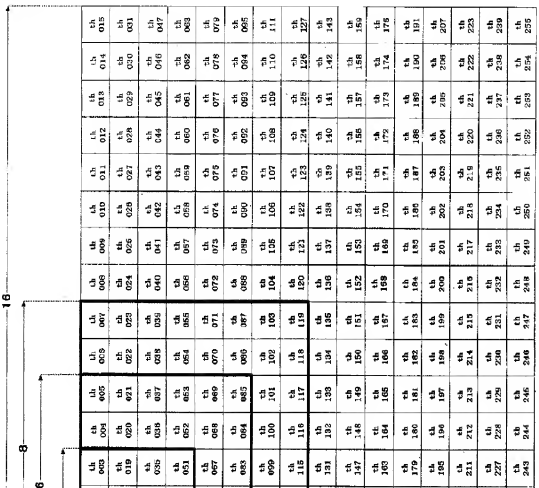
[Drawing 5]

【図5】


513
選択
511
2値選択
512
多値選択
503
バイナリフィルタ
509
選択
507
位相制御
508
位相制御
FIFO制御
FIFOメモリ
選択
502
先端画素制御
553
RAM(3)
505
2値/多値誤差拡散
506
多値レベル変換
504
2値／多値ディザ
514
簡易エッジ検出
501
変動2値化
510
選択
551
RAM(1)
γ変換閾値
γ変換濃度
RAM(2)
552

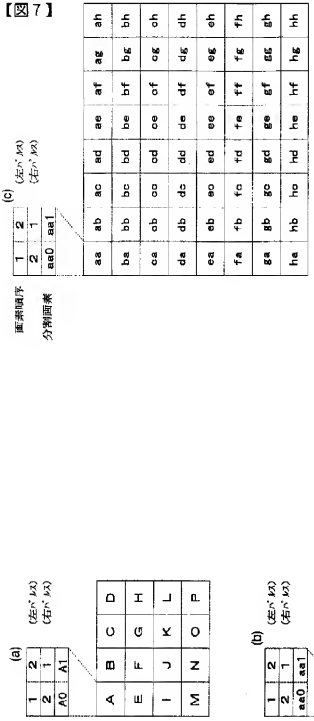
[Drawing 6]

【図６】



[Drawing 7]

【図7】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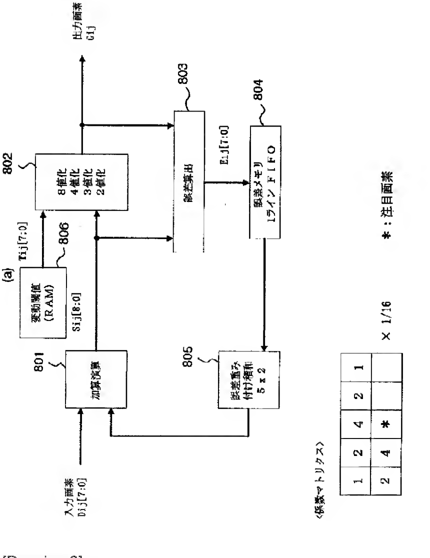
(左から 1x)
(右から 1x)
画素順序
分割画素
1 2
2 1
A0 A1
A B C D
E F G H
I J K L
M N O P
(b)
(左から 1x)
(右から 1x)
画素順序
分割画素
1 2
2 1
aa0 aa1
aa ab ac ad ae af
ba bb bc bd be bf
ca cb cc cd ce cf
da db dc dd de df
ea eb ec ed ee ef
fa fb fc fd fe ff
(c)
(左から 1x)
(右から 1x)
画素順序
分割画素
1 2
2 1
aa0 aa1
aa ab ac ad ae af ag ah
ba bb bc bd be bf bg bh
ca cb cc cd ce cf cg ch
da db dc dd de df dg dh
ea eb ec ed ee ef eg eh
fa fb fc fd fe ff fg fh
ga gb gc gd ge gf gg gh
ha hb hc hd he hf hg hh

[Drawing 8]

【図８】

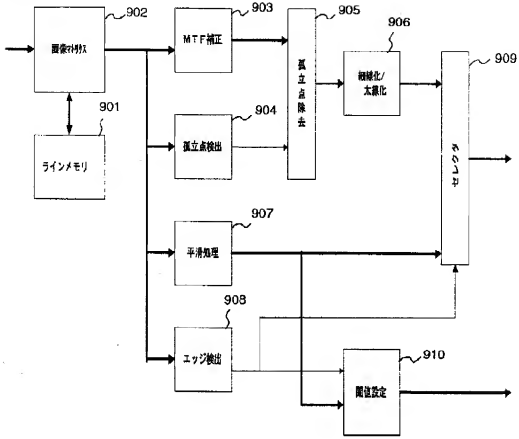


(b)

122	128	152	144	142	118	102	106
136	112	096	108	124	134	158	150
140	116	100	104	120	129	153	145
125	132	156	148	137	113	097	109
121	131	155	147	141	117	101	105
139	115	099	111	127	133	157	149
143	119	103	107	123	130	154	146
126	135	159	151	138	114	098	110

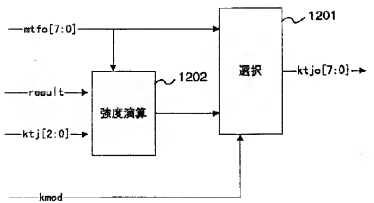
[Drawing 9]

【図９】



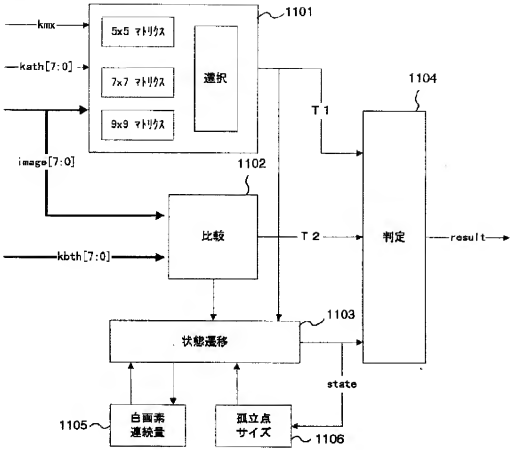
[Drawing 12]

【図１２】



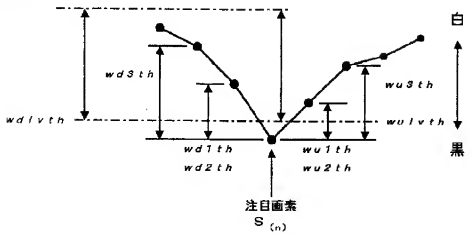
[Drawing 11]

【図１１】



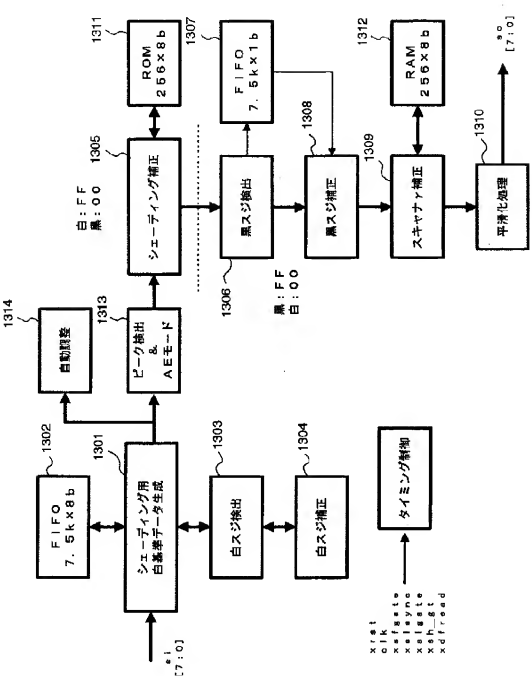
[Drawing 14]

【図１４】



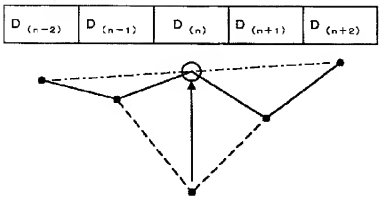
[Drawing 13]

【図１３】



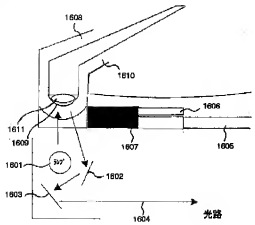
[Drawing 15]

【図１５】



[Drawing 16]

【図１６】



[Translation done.]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]It has the 1st read mode that uses a sheet through document feeder, and the 2nd read mode that uses a pressure plate, In an image processing device processed so that a manuscript may be read in one of the modes, read picture information may be changed into a picture signal by which digital conversion was carried out and it may become a picture signal in which an output is possible by making into a visual image a picture signal by which digital conversion was carried out, An image processing device provided with an image processing means which optimizes reading amendment independently by said 1st read mode and the 2nd read mode, respectively.
[Claim 2]The image processing device comprising according to claim 1:
A read position switching means to which said image processing means changes a read position by said 1st read mode and the 2nd read mode.
A control means to which optimal shading compensation is made to carry out according to said two modes, and a stripe compensation means which switches black stripe amendment and white stripe amendment according to said two modes, and performs stripe amendment.

[Claim 3]The image processing device comprising according to claim 2:
A means which changes shading correction data according to said 1st read mode and the 2nd read mode.
A means which changes a shading generated interval according to said two modes, and a means to control lamp lighting times according to said two modes.

[Claim 4]The image processing device comprising according to claim 2:
A means to perform black stripe amendment when reading a manuscript by the 1st read mode.
A means to perform white stripe amendment to a generate time of shading data used when

performing a shading compensation.

A means to set up a preset value for white stripe detection arbitrarily according to said 1st read mode and the 2nd read mode.

[Translation done.]